REMARKS

The Office Action dated March 22, 2005, and the references cited therein have been carefully considered. Claims 1-26 are presently pending. No claims currently stand allowed. Applicant has amended claims 1 and 13 to address clarity issues raised in the Office Action regarding the "relative" priority of the two types of executed tasks. Nowhere do the cited references disclose or suggest the presently claimed process controller/program/framework and method wherein an embedded application program that calculates set point values for the process controller is executed on the process controller at an assigned priority such that its operation can be halted/interrupted to allow for the execution of process control blocks that are executed at a higher execution priority than the embedded application. The presently pending claims are in proper form and patentable over the prior art presently known to Applicant. Accordingly, Applicant requests favorable reconsideration of the previous rejection of the now pending claims. Please charge any fees to Deposit Account No. 12-1216.

Summary of the Claim Rejections

The following identifies the authority and prior art applied to the identified claims for each rejection of the claims set forth in the Office Action dated March 22, 2005.

1. **Section 3**: Claims 1-12, 14, 18, and 19 are rejected under 35 U.S.C. § 112, as being indefinite for failing to particularly point out and distinctly claim the subject-matter which applicant regards as the invention.
2. **Sections 4-16**: Claims 1-7, 13-19 and 25-26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Iino et al. U.S. Patent 5,347,446 and Mann et al. U.S. Patent 5,891,178.
3. **Sections 17-19**: Claims 8-12 and 20-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Iino et al. U.S. Patent 5,347,446, Mann et al. U.S. Patent 5,891,178, and Messih U.S. Patent 5,526,794.

For the reasons set forth below, Applicant traverses each ground for the rejection of the pending claims.

Applicant's Responsive Comments

Applicant initially addresses the 35 U.S.C. § 112 rejections of claims 1-12, 14, 18 and 19 in **Section 3** of the Office Action. The Office Action asserts at **subsection 3a** that "dynamic model-based interactive control" is indefinite in claim 1 because there is no relationship or connection established of dynamic or interactive behavior in the rest of the claim. Applicant traverses the rejection of **claim 1** at **subsection 3a**.

Applicant acknowledges that "dynamic" and "interactive" are not explicitly recited in either the "embedded control task" or "set of control blocks." However, the two enumerated classes of instruction sequences recited in claim 1 are executed (at distinct execution priority status levels) in the claimed control processor to implement the recited "dynamic model-based interactive control of an industrial process." "Dynamic" refers to change. There are several references in the specification to the dynamic nature of the control processor. The linear program of the embedded control task calculates updated/changed process setpoints. The new setpoints are thereafter provided to control blocks to implement changes in the control of the industrial process. "Interactive" behavior exists in the set of control blocks that interact with physical devices of an industrial process. Thus, a relationship does indeed exist between "dynamic" and "interactive" and the recited elements in the body of claim 1.

The Office Action asserts at **subsection 3b** that "multivariable linear program" is indefinite in claim 1 because it is unclear whether or not "multivariable linear program" refers to the "dynamic model-based interactive control" in the preamble, and no relationship or connection has been established between the two terms. As explained previously herein above (see also page 11 of Applicant's specification), the multivariable linear program and the set of control blocks comprise integral components of a control processor that implements the "dynamic model-based interactive control of an industrial process" as recited in the preamble of claim 1.

The Office Action asserts at **subsection 3c** that the terms "relatively low" and "relatively high" render claim 1 indefinite. The Office Action further asserts that the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the claim. Applicant has amended claim 1 to specify that the embedded control task is executed at a relatively lower execution priority than the execution priority assigned to the set of control blocks (see

also, page 14 of Applicant's specification that describes the recited execution priority relationship between the embedded control task and the set of control blocks).

The Office Action asserts at **subsection 3d** that "wherein the set of control blocks comprise supervisory control blocks" in claims 2 and 14 is indefinite because it is not made explicitly clear in the claim language whether it comprises supervisory control blocks as well as regulatory blocks (of claim 1) or it comprises supervisory control blocks instead of regulatory blocks. Applicant respectfully submits that claims 2 and 14 recite that the set of control blocks comprises (includes) supervisory control blocks (e.g., MVL and MVC) *in addition to* the aforementioned regulatory control blocks (e.g., PID and ratio). These two types of control blocks are described and unequivocally distinguished in the specification.

The Office Action asserts at **subsection 3e** that "PID" in claims 6 and 18 is indefinite, and an acronym needs to be spelled out in the claims. The "P" corresponds to "proportional", the "I" corresponds to "integral" and the "D" corresponds to derivative in this acronym that is known to those of ordinary skill in the industrial process control art. The PID block type is used to automatically adjust a variable to hold a process variable at a specified set-point. When a measured variable deviates from the set-point, resulting in an error, the PID block applies its algorithms to eliminate the deviation/error.

The Office Action asserts at **subsection 3f** that "ratio" in claims 7 and 19 is indefinite "because it is not made explicitly clear in the claim language what the ratio is of." A ratio block, as recited in claims 7 and 19, like the PID block, is a control block utilized in a process control environment. Ratio blocks contain instruction sequences that ensure that two or more variables (specified by a control scheme designer/architect/programmer) are maintained at a specified ratio. For example, the variables might relate to two or more fluid flows that are kept at the same specified *ratio* even if their flows might change over time. The ratio control block calculates output control values that maintain a constant ratio between two or more flows. Therefore, responding to the Office Action's grounds for rejection, claims 7 and 19 refer to a general type of block rather than a specific application of the ratio block. Therefore, it is neither necessary nor proper to explicitly specify what is represented by the ratio or the specific numerator and denominator – it can be any two or more variables of interest to a process control architect.

Having addressed the Office Action's objections based upon the claim language, Applicant now addresses the prior art based rejections. In particular, Applicant traverses the Office Action's rejection in **Sections 4-16** of claims 1-7, 13-19 and 25-26 as obvious over Applicant's Admitted Prior Art (AAPA) in view of Iino et al. U.S. Patent 5,347,446 and Mann et al. U.S. Patent 5,891,178.

Claim 1, in contrast to AAPA, recites a control processor (a single piece of computing hardware on a network – see control processor 2 in Fig. 1, and control processor 102 in Figs. 2 and 3) that, in addition to executing a set of control blocks at a relatively high execution priority status (according to well-known control processor architectures), executes *a specific type of process control program (a linear program providing process setpoints) at a lower execution priority status* than the set of control blocks. The relatively low execution priority status process control program is referred to in claim 1 as an embedded control task (referred to as an "embedded control application 138" in the written description). The set of control blocks (assigned the relatively high execution priority status) drive a set of output signals controlling a set of field devices associated with the industrial process. The two distinct classes of program sequences recited in claim 1 are *executed* at distinct *execution* priority status levels in order to implement the dynamic model-based interactive control of the industrial process recited in the preamble.

Turning to the rejection of claim 1 in **Sections 5-7** of the Office Action, Applicant traverses the Office Action's characterization of the teachings of the prior art. Applicant agrees with the general application of Applicant's description of the state of the art at the time of Applicant's invention in **Section 5** of the Office Action.

With regard to **Section 6**, Applicant agrees that, at the time of the invention, a multi-variable linear program that provides a set of outputs corresponding to setpoints for a controlled process was known. However, Applicant respectfully submits that the Iino reference, while disclosing linear programs, does not teach or suggest modifying the prior art to include the recited linear programs into a control processor. To the contrary, Iino's predictive control apparatus 1 that renders point values (using quadratic equations according to the claimed invention) is separate and distinct from a process control unit 30 (or control processor) that executes a regulatory control program to render control signals for a process 40.

The Office Action asserts in Section 6, without any recitation to the teachings of the prior art, that executing the recited linear program on the control processor "would optimize

performance based on changing multiple variables." However, there is no such suggestion to make such a change anywhere in Iino. To the contrary, as explained by Applicant, incorporating linear programs of the type recited in claim 1 into the control processor would increase the load on the control processor – decreasing its ability to timely execute its set of control blocks. Thus, Iino does not suggest incorporating the recited multivariable linear program into a control processor as recited in Applicant's claim 1.

Applicant furthermore traverses the basis for rejecting claim 1, provided in **Section 7** of the Office Action, with regard to the relative priority assigned to the embedded control task (low) and the set of control blocks (high) recited in claim 1, because the system disclosed in Mann et al. (a pacemaker programmer system) (1) has virtually no relationship to the recited invention, and (2) does not suggest Applicant's recited multi-level control task execution scheme wherein a linear program providing set points is executed at a first priority level, and a set of control blocks execute at a priority level above the first level. Furthermore, Applicant traverses the Office Action's basis for applying Mann et al. – "this would increase the efficiency of the shifting/switch of tasks in AAPA and Iino."

As an initial matter, the disclosed subject-matter of the Mann et al. reference does not relate to a control processor for an industrial process. Mann et al. "relates to a diagnostic/programmer system, including software routines thereof, for enabling a physician to rapidly and accurately evaluate and modify the operation of an implanted pacemaker." (Col. 1, lines 16-19). Nowhere does the Office Action explain the applicability of teachings of this pacemaker servicing system to control processors for controlling an industrial process.

Furthermore, the tasks assigned relatively high/low priorities in column 10 of the Mann et al. patent are both data acquisition tasks (corresponding to the "regulatory control blocks" that Applicant explains at page 2 include I/O blocks). Mann et al. does not disclose or suggest a linear program, as recited in claim 1, providing process setpoints and executes at a priority below the priority assigned to the regulatory control blocks. In the event that the present rejection is not withdrawn, Applicant requests identification of the program component in the Mann et al. reference that runs upon a control processor and supplies process setpoints.

Finally, Applicant emphasizes that the invention recited in claim 1 is directed to a control processor that executes two distinct types of tasks at two distinct priority levels. The two distinct types of tasks recited in claim 1 were indeed known at the time of the invention. However, there is no suggestion in the prior art for executing the distinct tasks according to the

specifically recited priority levels. For this additional reason, Applicant submits that the present invention is patentable over the prior art.

Applicant traverses the Office Action's rejection of claims 2, 3, and 5-7 for at least the reasons provided hereinabove with regard to claim 1. Notwithstanding the existence of these particular types of control processor components in the prior art, none were arranged in a control processor and executed according to the scheme recited in claim 1 from which each of these claims depend. Applicant also notes that the Office Action appears to misinterpret the "ratio" block element recited in claim 7.

Applicant traverses the rejection of claim 4 for at least the reason that the recited "embedded control task" is neither disclosed nor suggested in the prior art. Therefore, the subject-matter of claim 4, directed to how the embedded task component is loaded on the control processor, is neither disclosed nor suggested in the prior art.

Applicant traverses the rejection of claims 13-19 in **Section 14** of the Office Action for at least the reasons expressed hereinabove with reference to claims 1-7.

Applicant traverses the rejection of claim 25 in **Section 15** of the Office Action for the same reasons provided above regarding claim 1. The prior art does not disclose or suggest the recited tasks being executed according to the recited priority scheme of claim 25.

Applicant traverses the rejection of claim 26 in **Section 16** of the Office Action for at least the reasons provided above regarding claim 1. Applicant further notes that the Office Action does not address the modifications to the prior art to accommodate the *two distinct configurable repetition periods and two levels of priorities* associated with the two distinct types of instruction sequence types executed by the claimed control processor program code execution arrangement.

Applicant traverses the rejection of claims 8-12 and 20-24 in **Sections 17-19** of the Office Action as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Iino et al. U.S. Patent 5,347,446, Mann et al. U.S. Patent 5,891,178, and Messih U.S. Patent 5,526,794. In general, the Office Action does not explain how the teachings of Messih et al. apply to the specific multi-level control program execution scheme (including an embedded task and a set of control blocks operating at different priorities) recited in each of the claims. Furthermore, Applicant traverses the application of Messih's teachings regarding a car engine

to the present invention which is directed to a control program execution scheme for an industrial process (potentially having orders of magnitude greater numbers of variables than a car engine control program). With regard to the rejection of claims 8 and 20, the Office Action does not identify where any of the cited references specifies a repetition cycle parameter associated with the embedded (low priority task). The claimed repetition period for the embedded task is distinguished from the repetition period of the set of control blocks (high priority task).

Applicant traverses the rejection of claims 9 and 21 for at least the reasons set forth for the claims from which they depend. Furthermore, the prior art neither discloses nor suggests the claimed supervisory control block, within the set of control blocks (operating at the higher priority), that controls commencing a repetition cycle of the embedded (lower priority) task.

Applicant traverses the rejection of claims 10 and 22 for at least the reasons set forth above regarding the independent claims from which these claims depend.

Applicant traverses the rejection of claims 11 and 23 since the cited references do not disclose or suggest a period for an embedded task repetition cycle.

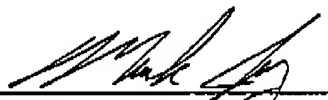
Applicant traverses the rejection of claims 12 and 24 since none of the cited references discloses or suggests an embedded repetition period exceeding a block processing cycle period.

In the event that the rejections of claims 8-12 and 20-24 are not withdrawn, Applicant respectfully requests identification of the specific portions of the cited references corresponding to the recited claim elements.

Conclusion

Applicant submits that the prior art neither discloses nor suggests the claimed multi-level control task execution scheme wherein an embedded multi-variable linear program, that provides setpoints for an industrial process, executes at a low priority level on a control processor. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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Date: September 20, 2005